UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/535,317	02/03/2006	Donghua Xu	51631/JWP/C543	5686

23363 7590 04/08/2008
CHRISTIE, PARKER & HALE, LLP
PO BOX 7068
PASADENA, CA 91109-7068

EXAMINER	
SHEVIN, MARK L	

ART UNIT	PAPER NUMBER
1793	

MAIL DATE	DELIVERY MODE
04/08/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/535,317	XU ET AL.	
	Examiner	Art Unit	
	Mark L. Shevin	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 May 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *05/22/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status

1. Claims 1-35, filed 05/17/2005, are pending.

Information Disclosure Statement

2. The references with lines through them were not considered by the Examiner because there was no publication date indicated.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1-2, 4, 6, 10, 15, and 17** are rejected under 35 U.S.C. 102(b) as being anticipated by **Park** (T.G. Park, Development of new Ni-based amorphous alloys containing no metalloid that have large undercooled liquid regions, *Scripta mater* 43, (2000), p. 109-114.)

Regarding claim 1, Park discloses a $Ni_{57}Zr_{20}Ti_{17}Al_5Sn_1$ amorphous alloy in Table 2 on p. 112. If X and Y in claim are 0 ("less than..." includes zero), then claim 1 only requires Ni_a $(Ti,Zr)_b$ $(Al_{1-z}AM_z)_c$ and with respect to Park's alloy, a is 57 (within range of 27-58), b is 37 (within range of 21 to 59), c is 6 (within range of 5 to 17), z is 1/6 (within range of 0 to 0.3) and the sum of X, Y, and Z is 1/6 (within range of 0 to 0.5). Furthermore, the Ti and Zr contents are within the claimed ranges of 8+ and 13+, respectively.

Thus claim 1 is anticipated by Park.

Regarding claim 2, the silicon content of the alloy is less than 1%, namely 0% at Park does not have any silicon content in his disclosed alloy.

Regarding claim 4, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Regarding claim 6, the ΔTsc value for the Ni-Zr-Ti-Al-Sn alloy of Park at the bottom of Table 2 is 50°C, which is within the claimed temperature range of "more than 40 °C".

Regarding claim 10, the ratio of the glass transition temperature, T_g, to the liquidus temperature, T_m, is 0.614, which is within the claimed range of "0.6 or more."

Regarding claim 15, Park discloses a $Ni_{57}Zr_{20}Ti_{17}Al_5Sn_1$ amorphous alloy in Table 2 on p. 112. If X and Y in claim are 0 ("less than..." includes zero), then claim 1 only requires Ni_a $(Ti,Zr)_b$ $(Al_{1-z}$ $AM_z)_c$ and with respect to Park's alloy, a is 57 (within range of 27-58), b is 37 (within range of 21 to 59), c is 6 (within range of 5 to 17), z is 1/6 (within range of 0 to 0.3) and the sum of X, Y, and Z is 1/6 (within range of 0 to 0.5). Furthermore, the Ti and Zr contents are within the claimed ranges of 8+ and 13+, respectively and the copper content is less than 17 (0 is within the range 0-17).

Regarding claim 17, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 1-2, 4, 6-11, 13, 15, 17, 19, 23, and 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Li** (TW 458828 B - Abstract).

Li discloses a powder of an amorphous alloy with a broad super-cooled liquid region of $Ni_aZr_bTi_cAl_dSn_e$ where a: 37-57, b: 20-30, c: 17-23, d: 5-10, and e: 1-3

Regarding claim 1, if X and Y in claim are 0 ("less than..." includes zero), then claim 1 only requires Ni_a $(Ti,Zr)_b$ $(Al_{1-z}$ $AM_z)_c$ and with respect to Li's alloy, a is 37-57 (which overlaps the claimed range of 27-58), b is 37-53 (which overlaps the claimed range of 21 to 59), c is 6-13 (which overlaps the claimed range of 5-17), and z is 0.1 to 3/5, (which overlaps the claimed range of 0-0.3). The sum of x+y+z is then 0.1-3/5, which overlaps the range of 0-0.5. Finally the titanium and zirconium contents overlap the claimed range as Zr is present from 20 to 30 at% (meets the "more than 13 atomic percent" limitation) and Ti is present from 17 to 23 at% (meets the "more than 8 atomic percent" limitation).

It would have been obvious to one of ordinary skill in metallurgy, taking the disclosure of Li as a whole, to work within the disclosed compositions ranges to form the instantly claimed amorphous alloys as MPEP 2144.05, para I states: "In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists." Thus Li establishes a prima facie case of obviousness with respect to instant claim 1.

Regarding claim 2, the silicon content of the alloy is less than 1%, namely 0% at Li does not have any silicon content in his disclosed alloy.

Regarding claim 4, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Regarding claims 6-11, 13, these physical and mechanical properties depend on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claim 1 above, one of ordinary skill would expect the same alloy to have the same physical and mechanical properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

Regarding claim 15, if X and Y in claim are 0 ("less than..." includes zero), then claim 1 only requires Ni_a $(Ti,Zr)_b$ $(Al_{1-z}$ $AM_z)_c$ and with respect to Li's alloy, a is 37-57

(which overlaps the claimed range of 27-58), b is 37-53 (which overlaps the claimed range of 21 to 59), c is 6-13 (which overlaps the claimed range of 5-17), and z is 0.1 to 3/5, (which overlaps the claimed range of 0-0.3). The sum of x+y+z is then 0.1-3/5, which overlaps the range of 0-0.5. Finally the titanium, zirconium, and copper contents overlap the claimed range as Zr is present from 20 to 30 at% (meets the "more than 13 atomic percent" limitation), Ti is present from 17 to 23 at% (meets the "more than 8 atomic percent" limitation), and Cu is present at 0% (meet the "less than 7 atomic percent" limitation).

It would have been obvious to one of ordinary skill in metallurgy, taking the disclosure of Li as a whole, to work within the disclosed compositions ranges to form the instantly claimed amorphous alloys as MPEP 2144.05, para I states: "In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists." Thus Li establishes a prima facie case of obviousness with respect to instant claim 15.

Regarding claim 17, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Regarding claim 19, this physical property depends on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claim 15 above, one of ordinary skill would expect the same alloy to have the same physical and properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require

an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

Regarding claim 23, Li discloses a Ni-Ti-Zr-Al with Ni present from 37 to 57%, Ti (a) present from 17-23% (which overlaps the claimed range of 8-22%), Zr (b) present from 20-30% (which overlaps the claimed range of 13-37%), and Al (c) present from 5-10% (which overlaps the claimed range of 5-17%). The sum of a+b+c is between 42 and 63 (which overlaps the claimed range of 53 to 73).

Regarding claim 26, this physical property depends on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claim 23 above, one of ordinary skill would expect the same alloy to have the same physical and properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

5. Claims 3, 5, 14, 16, 18, 20, 21-22, 24-25, and 27-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Li** (TW 458828 B - Abstract) as applied to claims 1-2, 4, 6-11, 13, 15, 17, 19, 23, and 26 above, in further view of **Kim** (US 6,325,868).

The disclosure of Li was discussed in the 103 rejections above, however Li does not teach the ratio of aluminum to an additive metal as less than 0.1, nor the addition of copper.

Kim discloses nickel-based amorphous alloy compositions. One embodiment is represented by the general formula $Ni_a(Zr_{1-x}\ Ti_x)_bSi_c$ where a is 45-63 at%, b is 32-48 at% and c is 1-11 at% (Abstract). X is between 0.4 and 0.6 (col. 2, lines 46-50).

At least one kind of element selected from the group consisting of V, Cr, Mn, Cu, Co, W, Sn, Mo, Y, C, B, P, and Al, can be added in the range of 2-15 at% (Abstract). This additive provides the nickel alloy with the ability to form bulk metallic glasses with thickness of 1 mm or more and increases amorphous phase-forming ability (col. 3, lines 24-50).

Regarding claim 3, Li's alloy, with x and y set to zero, has an 'a' of 37-57 (which overlaps the claimed range of 39-47), a 'b' of 37-53 (which overlaps the claimed range of 42-48), a 'c' of 6-13 (which overlaps the claimed range of 9-11) and a sum of x, y, and z within the claimed range of 0.1 to 3/5 (which overlaps the claimed range of 0-0.2) and the contents of Ti and Zr (17-23 and 20-30, respectively) overlap the claimed ranges of "more than 15 atomic percent" and "more than 27 atomic percent", respectively.

It would have been obvious to one of ordinary skill in the metallurgy arts, at the time the invention was made, taking the disclosures of Li and Kim as a whole, to combine Li in view of Kim to adjust the ratio of Al to Sn so that z is in the range of 0-0.1 as Kim teaches that Al can be present in a Ni-Zr-Ti type alloy from 2-15 percent and that

Sn is Al are art recognized equivalents for the same purpose of glass-forming ability. Thus one of ordinary skill could modify Li to reduce Sn content while increasing the content of Al, up to 15 at%, which would lower the ratio of AM to Al. Motivation to adjust the ratio of Al to AM comes from the general tendency of one of ordinary skill in the art to optimize ranges within the bounds disclosed in the prior art in the course of routine experimentation.

Regarding claim 5, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Regarding claim 14, this physical property depends on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claim 3 above, one of ordinary skill would expect the same alloy to have the same physical and properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

Furthermore, the amorphous nickel-base alloys are introduced as meeting "the above-mentioned desires" (col. 2, lines 25-28) which includes superior amorphous phase-forming ability where crystallization is avoided even under the conditions of low cooling rates of 103 K/s or less. It is important to have these low cooling rates in order

to have amorphous phase formation and viscous flow in the supercooled region during molding. (col. 1, lines 43-55).

Regarding claim 16, beyond the limitation met by the rejection to claim 15, Li teaches nickel, 'a', in the range of 37 to 57 at% (which overlaps the claimed range of 39 to 47 at%), titanium and zirconium, 'b', in the range of 37 to 53 at% (which overlaps the claimed range of 42 to 48 at%), and Al and Sn, 'c', in the range of 6 to 13 at% (which overlaps the claimed range of 9 to 11 at%). The content of titanium is 17 to 23 at% (which is more than 17 at% as claimed), and the zirconium content is 20 to 30 at% (which overlaps the "more than 27 atomic percent limitation"). Kim then suggests that either of Cu or Sn, among other elements, should be added to a Ni-Zr-Ti type amorphous alloy in the range of 2 to 15 at% (Abstract and col. 3 lines 36-49). Thus it would have been obvious for one of ordinary skill in the art to art Cu to the Ni-Zr-Ti-Al-Sn alloy of Li as Kim taught that Sn and Cu are interchangeable in that the both work as additive elements to help improve the ability to form bulk amorphous glasses. Motivation to add copper further comes from the suggestions of Kim at col 3, lines 36-49 and col. 5, lines 1-20 to at additive elements such as Cu and Sn to produce an alloy with an amorphous phase when cooled at a cooling rate of 10^3 K/s or less and having a super-cooled region of 20K or larger.

See the rejection to claim 3 for the rationale behind why it would have been obvious to alter the x, y, and z ratios.

Regarding claim 18, as stated before, the ETM is controlled by the atomic fraction Y which was set to zero, as was TM (controlled by X). The additive material, AM, is Sn.

Regarding claim 20, this physical property depends on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claim 16 above, one of ordinary skill would expect the same alloy to have the same physical and properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

Furthermore, the amorphous nickel-base alloys are introduced as meeting "the above-mentioned desires" (col. 2, lines 25-28) which includes superior amorphous phase-forming ability where crystallization is avoided even under the conditions of low cooling rates of 10^3 K/s or less. It is important to have these low cooling rates in order to have amorphous phase formation and viscous flow in the super-cooled region during molding. (col. 1, lines 43-55).

Regarding claims 21 and 22, Li teaches a Ni-Zr-Ti-Al-Sn alloy where Ni is present from 37-57 at% (overlaps claimed nickel range), Ti is present from 17 to 23 at% (overlaps claimed 'a' range), Zr is present from 20 to 30 at% (overlaps claimed 'b' range), and Al is present from 5 to 10 at% (overlaps claimed 'c' range). It would have

been obvious to one of ordinary skill in metallurgy to then substitute Cu for Sn and to add from 2 to 15 at% of Cu to the Ni-Zr-Ti-Al alloy as Kim suggests adding Cu to a Ni-Zr-Ti type amorphous alloy. Motivation to add copper comes from the suggestions of Kim at col 3, lines 36-49 and col. 5, lines 1-20 to at additive elements such as Cu and Sn to produce an alloy with an amorphous phase when cooled at a cooling rate of 10^3 K/s or less and having a super-cooled region of 20K or larger.

Regarding claims 24 and 25, this physical property depends on the composition of the material as no processing steps have been claimed. As the Ni-based amorphous alloy of Li was argued to establish a prima facie case of obviousness with respect to instant claims 21 and 22 above, one of ordinary skill would expect the same alloy to have the same physical and properties. From MPEP 2112, para. V, subpara 1: "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on 'inherency' under 35 U.S.C. 102, on '*prima facie* obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same..."

Furthermore, the amorphous nickel-base alloys are introduced as meeting "the above-mentioned desires" (col. 2, lines 25-28) which includes superior amorphous phase-forming ability where crystallization is avoided even under the conditions of low cooling rates of 103 K/s or less. It is important to have these low cooling rates in order to have amorphous phase formation and viscous flow in the super-cooled region during molding. (col. 1, lines 43-55).

Regarding claims 27-32, it would have been obvious to form a three dimensional article of the amorphous alloy of claims 1, 3, 15, 21, 22, and 23 as Kim teaches that the very similar Ni-Ti-Zr type amorphous alloys of his invention have high strength, good abrasion resistance, and superior corrosion resistance, so they can easily form bulk amorphous alloys and these alloys can be formed into high strength and abrasion-resistance parts, structural materials, and welding/coating materials (col. 8, lines 31-37). Motivation to form these parts comes from a desire to utilize the good mechanical and physical properties of such nickel-base amorphous alloys as taught by Kim.

Regarding claim 33, Li discloses a powder of an amorphous alloy with a broad super-cooled liquid region of $Ni_aZr_bTi_cAl_dSn_e$ where a: 37-57, b: 20-30, c: 17-23, d: 5-10, and e: 1-3. It would have been obvious to one of ordinary skill in metallurgy, at the time the invention was made, taking the disclosures of Li and Kim as whole, to combine Li in view of Kim to substitute Sn for Cu, reduce the titanium content to 16 at%, and optimize the Ni, Zr, Al, and Cu contents within the disclosed ranges to yield the instantly claimed alloy for the following reasons:

It would have been obvious to one of ordinary skill in metallurgy to then substitute Cu for Sn and to add from 2 to 15 at% of Cu to the Ni-Zr-Ti-Al alloy as Kim suggests adding Cu to a Ni-Zr-Ti type amorphous alloy. Motivation to add copper comes from the suggestions of Kim at col 3, lines 36-49 and col. 5, lines 1-20 to at additive elements such as Cu and Sn to produce an alloy with an amorphous phase when cooled at a cooling rate of 10^3 K/s or less and having a super-cooled region of 20K or larger. Motivation to reduce the titanium content comes the range disclosed by Kim, namely

13.2 at% (x=0.4 at 33 at% of Zr+Ti total) to 27.6 at% (x=0.6 at 46 at% of Zr+Ti total). Within the disclosed ranges of Ni, Ti, Zr, Al, and Cu, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed element concentrations through process optimization, since it has been held that there the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Regarding claim 34, Li discloses a powder of an amorphous alloy with a broad super-cooled liquid region of $Ni_aZr_bTi_cAl_dSn_e$ where a: 37-57, b: 20-30, c: 17-23, d: 5-10, and e: 1-3. It would have been obvious to one of ordinary skill in metallurgy, at the time the invention was made, taking the disclosures of Li and Kim as whole, to combine Li in view of Kim to substitute Sn for Cu, and to optimize the Ni, Ti, Zr, Al, and Cu contents within the disclosed ranges to yield the instantly claimed alloy for the following reasons:

It would have been obvious to one of ordinary skill in metallurgy to then substitute Cu for Sn and to add from 2 to 15 at% of Cu to the Ni-Zr-Ti-Al alloy as Kim suggests adding Cu to a Ni-Zr-Ti type amorphous alloy. Motivation to add copper comes from the suggestions of Kim at col 3, lines 36-49 and col. 5, lines 1-20 to at additive elements such as Cu and Sn to produce an alloy with an amorphous phase when cooled at a cooling rate of 10^3 K/s or less and having a super-cooled region of 20K or larger.

Within the disclosed ranges of Ni, Ti, Zr, Al, (Li) and Cu (Kim), it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed element concentrations through process optimization, since it has

been held that there the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

Regarding claim 35, Li discloses a powder of an amorphous alloy with a broad super-cooled liquid region of $Ni_aZr_bTi_cAl_dSn_e$ where a: 37-57, b: 20-30, c: 17-23, d: 5-10, and e: 1-3. It would have been obvious to one of ordinary skill in metallurgy, at the time the invention was made, taking the disclosures of Li and Kim as whole, to combine Li in view of Kim to substitute Sn for Cu, add Si, reduce the Ti content to 15.92 at%, and optimize the Ni, Zr, Al, Cu, and Si contents within the disclosed ranges to yield the instantly claimed alloy for the following reasons:

It would have been obvious to one of ordinary skill in metallurgy to then substitute Cu for Sn and to add from 2 to 15 at% of Cu to the Ni-Zr-Ti-Al alloy as Kim suggests adding Cu to a Ni-Zr-Ti type amorphous alloy. Motivation to add copper comes from the suggestions of Kim at col 3, lines 36-49 and col. 5, lines 1-20 to at additive elements such as Cu and Sn to produce an alloy with an amorphous phase when cooled at a cooling rate of 10^3 K/s or less and having a super-cooled region of 20K or larger. Motivation to reduce the titanium content comes the range disclosed by Kim, namely 13.2 at% (x=0.4 at 33 at% of Zr+Ti total) to 27.6 at% (x=0.6 at 46 at% of Zr+Ti total).

With respect to Si, Kim teaches that Si should be present between1 and 11 at% and that if the additive content is less than 1 at%, the amorphous phase-forming ability is reduced. This teaching by Kim would not deter one of ordinary skill in the art from working within the range disclosed between Li (0) and Kim (1-11) (see MPEP 2144.05,

Para I, subpara III) as Kim suggested the additive elements such as Cu and Al is provide bulk amorphous alloy forming qualities and thus would be increased to make up for the lower Si content. Furthermore, Park (from NPL reference above), teaches that the addition of metalloids such as Si "significantly improves the GFA of Ni-based amorphous alloys" (Introduction, p. 109).

Within the disclosed ranges of Ni, Ti, Zr, Al, Cu, and Si, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the instantly claimed element concentrations through process optimization, since it has been held that there the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

6. **Claim 12** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Li** (TW 458828 B - Abstract) as applied to claims 1-2, 4, 6-11, 13, 15, 17, 19, 23, and 26 above, in further view of **Hays** (US 2002/0003013 A1).

The disclosure of Li was discussed in the 103 rejections above, however Li does not teach the presence of a ductile crystalline phase precipitate.

Hays is drawn to a new class of metallic glass materials that employ the previously unknown physical mechanism of shear band pattern formation. The presence of in-situ precipitated ductile crystalline phases in the metallic glass is suggested in utilize the phenomenon of shear band pattern formation, which dramatically increases the plastic strain to failure, impact resistance, and toughness of the material (paras 0007 and 0008).

Regarding claim 12, it would have been obvious to one of ordinary skill in metallurgy, at the time the invention was made, taking the disclosures of Li and Hays as a whole, to combine Li in view of Hays to form crystalline ductile phases in the bulk metallic glass of Li as Hays teaches that such ductile crystalline phases increase the plastic strain to failure, impact resistance, and toughness of the material (para 0007).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Xu: CN 1,354,274
Hays: US 2002/0003013 A1
Bae: US 2003/0140987 A1
Park US 2006/0231169 A1
Yim US 2006/0237105 A1

Lee: M.H. Lee et al. Quaternary and quinary Ni-based amorphous alloys in the 3Ni-Zr-Ti-X (X=Al,Si,P) and Ni-Zr-Ti-Si-Y (Y=Sn, Mo, Y) systems. *Mat. Res. Soc. Symp. Proc.*, Vol. 644, (2001) L.4.8.1 – L4.8.6.

-- Claims 1-35 (All pending) are rejected
-- No claims are allowed

The rejections above rely on the references for all the teachings expressed in the text of the references and/or one of ordinary skill in the metallurgical art would have reasonably understood or implied from the texts of the references. To emphasize certain aspects of the prior art, only specific portions of the texts have been pointed out. Each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

All recited limitations in the instant claims have been met by the rejections as set forth above. Applicant is reminded that when amendment and/or revision is required, applicant should therefore specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. § 1.121; 37 C.F.R. Part §41.37 (c)(1)(v); MPEP §714.02; and MPEP §2411.01(B).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-

3588. The examiner can normally be reached on Monday - Thursday, 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark L. Shevin/

/Roy King/

Supervisory Patent Examiner, Art Unit 1793

March 25th, 2008
10-535,317